Sublight Engineering PLLC

MALDEN+REVERE+LYNN +EVERETT RF EXPOSURE ASSESSMENT

Abstract

Multiple pole mounted antenna installations in Malden, Revere, Lynn, and Everett, MA

Based on this assessment, RF exposure levels in accessible areas near these installations will be below FCC limits for the General Public.

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Sublight Engineering PLLC (Sublight) has been asked to assess compliance with the Federal Communications Commission (FCC) Radio Frequency (RF) exposure limits near the installations detailed below. ExteNet Systems, Inc. engaged Sublight and provided information for this assessment.

T-Mobile will provide wireless communications services using this ExteNet antenna system consisting of 122 installations or nodes. The equipment operates in the PCS, AWS, and BRS bands.

This assessment reviewed RF exposure with respect to FCC limits in accessible areas near all the installations using worst-case computer modeling.

Based on this assessment, and with the recommendations below, RF exposure levels in accessible areas near these installations will be below FCC limits for the General Public.

Installation Location

This assessment covers a set of 122 pole mounted antenna installations in Malden, Revere, Lynn, and Everett, MA. Details of the locations can be found in the node list below.

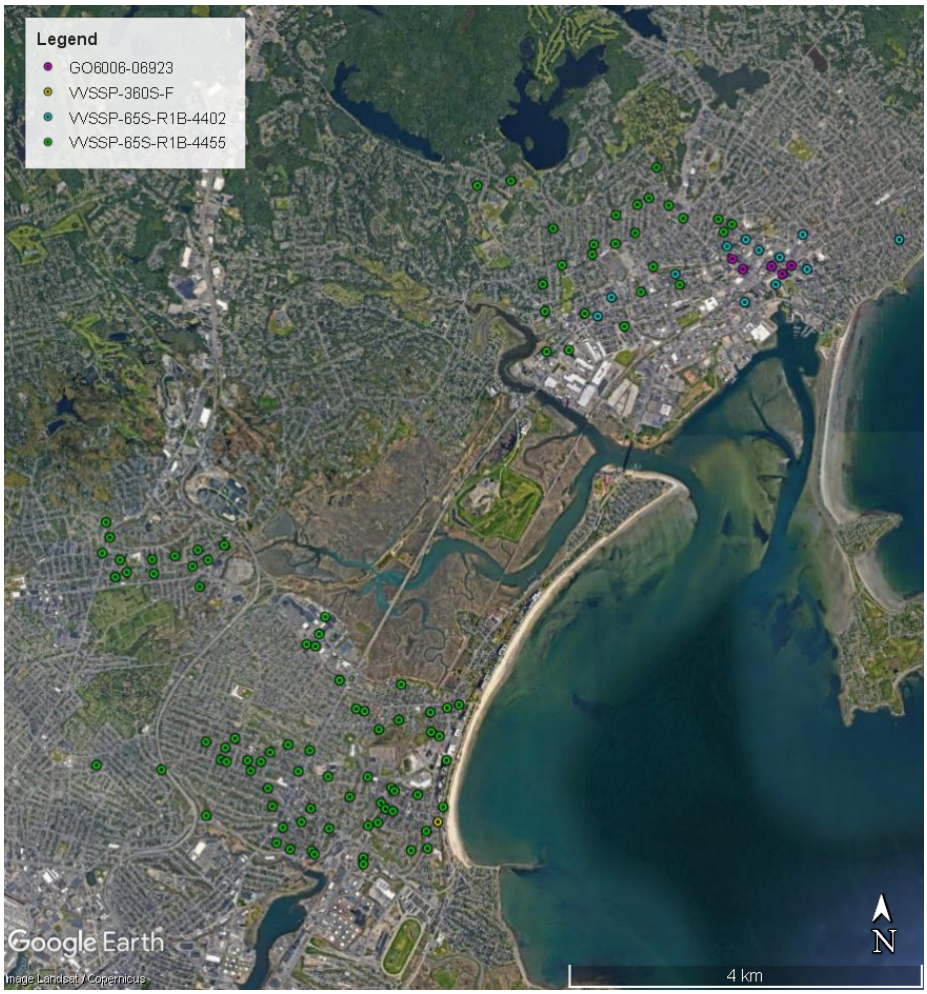


Figure 1 Google Earth Overview

Antenna and Transmitter Information

Each site or node has one antenna directly connected to radios from T-Mobile (no combiner network). There are 4 configurations with different antennas and / or radio powers. The antennas are detailed below with radios operating in the PCS, AWS, and BRS/EBS bands. The radio powers are listed in the configuration table.

The CommScope VVSSP-360S-F antenna is a quasi-omni antenna that is designed for the PCS, AWS, WCS, BRS/EBS, CBRS, and U-NII bands. The WCS, CBRS, and U-NII bands are not used for this project. This antenna provides RF coverage in all direction.

VVSSP-360S-F

10-port small cell antenna, 4x 1695–2690, 4x 3400-3800 and 2x 5150-5925 MHz. 360° Horizontal Beamwidth, fixed tilt.

Electrical Specifications

Frequency Band, MHz	1695–1920	1920–2180	2300–2690	3400–3800	5150–5925
Gain, dBi	6.6	7.3	8.2	4.9	5.1
Beamwidth, Horizontal, degrees	360	360	360	360	360
Beamwidth, Vertical, degrees	21.9	19.1	15.6	39	22.4
Beam Tilt, degrees	7	7	7	0	0
USLS (First Lobe), dB	14	14	12	19	9
Isolation, Cross Polarization, dB	25	25	25	25	25
Isolation, Inter-band, dB	28	28	28	28	28
VSWR | Return loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-150		
Input Power per Port, maximum, watts	125	125	125	35	20

The CommScope VVSSP-65S-R1B antenna is a directional antenna that is designed for the PCS, AWS, WCS, BRS/EBS, CBRS, and U-NII bands. The WCS, CBRS, and U-NII bands are not used for this project. This antenna concentrates RF coverage in one direction with a 70° to 85° half-power beamwidth.

VVSSP-65S-R1B

10-port small cell antenna, 4x 1695–2690, 4x 3400-3800 and 2x 5150-5925 MHz. 65° HPBW, Internal RET and SBT

Electrical Specifications

Frequency Band, MHz	1695–1920	1920–2180	2300–2690	3400–3800	5150–5925
Gain, dBi	11.6	12.3	12.8	9.8	4.2
Beamwidth, Horizontal, degrees	85	74	70	71	73
Beamwidth, Vertical, degrees	22.9	19.7	16	32.9	26.3
Beam Tilt, degrees	2–10	2–10	2–10	7	4
USLS (First Lobe), dB	14	16	15	11	13
Front-to-Back Ratio at 180°, dB	25	28	26	25	26
Isolation, Cross Polarization, dB	25	25	25	25	25
Isolation, Inter-band, dB	25	25	25	25	25
VSWR | Return loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-150		
Input Power per Port at 50° C, maximum, watts	75	75	75	35	20

Figure 2 Cabling Configuration

The Galtronics GO6010-07078 antenna is a directional ship antenna that is designed for the PCS, AWS, WCS, BRS/EBS, CBRS, and U-NII bands. The WCS, CBRS, and U-NII bands are

not used for this project. This antenna concentrates RF coverage in one direction with a 119° to 151° half-power beamwidth.

GALTRONICS

WE'RE MAKING WAVES™

60" x 2" 10-Port Outdoor Directional Whip Antenna [1695-2690, 3400-3800 and 5150-5925 MHz]

GO6010-07078

Description:

- Directional Whip Antenna for Outdoor DAS and Small Cells
- 4x ports for AWS/PCS Band 1695-2690 MHz
- 4x ports for CBRS Band 3400-3800 MHz
- 2x ports for LAA Band 5150-5925 MHz
- Ideal for Dense Urban Densification
- All ports are directional to ensure dominance over macro sites

Electrical Specifications

Frequency Band [MHz]	1695-2690	3400-3800	5150-5925
Input Connector Type	4x NEX10 (F)	4x NEX10 (F)	2x NEX10 (F)
Isolation (min.)	25 dB	20 dB	
VSWR (max.) / RL (min.)	1.5:1 / 14.0 dB		
Impedance	50 Ω		
Polarization	Vertical	Dual Slant 45° (± 45°)	
Horizontal Beamwidth	151°	135°	119°
Elevation Beamwidth	31.0°	36.0°	22.6°
Gain (max.)	9.3 dBi	7.0 dBi	5.5 dBi
Gain (avg.)	7.5 dBi	6.0 dBi	4.6 dBi
Downtilt	10° fixed		
Max Power / Port	50 Watts		1 Watt
PIM @ 2x43 dBm	<-153 dBc	N/A	N/A

1695-2690, 3400-3800 and 5150-5925 MHz
10-Port Outdoor Directional Whip Antenna

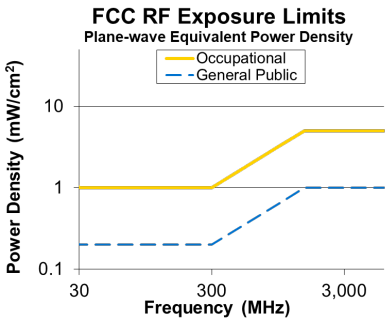
Figure 3 GO6010-07078 Antenna

RF Exposure Ray-Tracing Assessment

This RF Exposure assessment is based on power density modeling and a comparison with whole body exposure limits set by the Federal Communications Commission (FCC) and codified in their rules[1]. The FCC has two limits: one for the General Public and a less conservative or higher limit for Occupational workers. An Occupational worker is defined as someone who through training and notification can understand and control their exposure to RF that they may encounter in the workplace. Everyone else is considered the General Public. In this assessment, both limits are considered but the stricter, General Public, limits are used to determine compliance.

This assessment uses maximum power to the antennas and conservative modeling techniques to determine the greatest possible extent of compliance boundaries. Outside the boundaries, exposure levels will always be below the limits. Most of the time, the actual power will be much less, likely by a large margin, so levels will be below exposure limits even within the boundaries.

FCC plane-wave equivalent power density limits for maximum permissible exposure are derived from the whole-body SAR limits and expressed in milliwatts per square centimeter (mW/cm^2). FCC exposure limits are for continuous exposure spatial-averaged over the whole body and time-averaged, over 6 minutes for Occupational and 30 minutes for General Public limits. To account for changes in absorption relative to frequency, the limits are dependent on the frequency of the RF energy. This graph indicates that frequency relationship.



To calculate exposure and compliance boundaries, power density from each source (exposure value by frequency EV_f) is divided by the appropriate exposure limit (EL_f), creating an exposure ratio (ER_f).

$$ER_f = \frac{EV_f}{EL_f}$$

Ratios from each source are combined to determine a total exposure ratio TER. This ratio is used to determine exposure and compliance boundaries.

$$TER = \sum_{i=1}^{n} ER_i$$

RF power density levels are calculated using the IXUS Modeler[2]. IXUS employs a synthetic ray tracing method for panel and omnidirectional antennas and a conservative cylindrical envelope method for microwave dish (parabolic reflector / aperture) antennas.

[1] 47 CFR § 1.1310 Radiofrequency radiation exposure limits, US Code of Federal Regulations

[2] IXUS EMF Compliance Management Software version 3.8 (0) (Calculator 15.0) provided by Alphawave Mobile Network Products http://www.ixusapp.com.

The ray tracing method is an advanced computation method described in IEC 62232[3]. The power is summed from elemental sources representing the individual components of the antenna. These elemental sources are selected by an analysis of the proposed antennas and their manufacturers datasheets. Ray tracing algorithms typically overestimate RF field strength due to absorption of RF energy in the ground, building walls and other man-made structures.

IXUS combines results from all sources to create graphic 3D compliance boundaries around antennas.

Note: The Galtronics GO6010-07078 pattern model was not available, so the very similar Galtronics GO6006-06923 pattern was used. The compliance distances for the frequencies in use for this study are substantially the same for these two antennas.

Assessment

A review of all 122 sites showed no publicly accessible locations are exposed to levels that may exceed the General Public limits.

Site NE1217BA_11LAB's compliance boundary was close to an adjacent building and was reoriented to provide more clearance, changing from an azimuth of 165° to 225° relative to true north.

Site NE1230BA_21LAB's compliance boundary was close to an adjacent building roof and was reoriented to provide more clearance, changing from an azimuth of 90° to 75° relative to true north.

Small areas near the antennas are predicted to exceed the Occupational compliance boundary.

The following depictions graphically show compliance boundaries with respect to the antenna and their mount pole for each configuration. Yellow indicates areas that may exceed the FCC's General Public exposure limits while red indicates areas that may exceed the Occupational limits.

[3] IEC 62232:2017, Determination of RF field strength and SAR in the vicinity of radiocommunication base stations for the purpose of evaluating human exposure, International Electrotechnical Commission, Geneva.

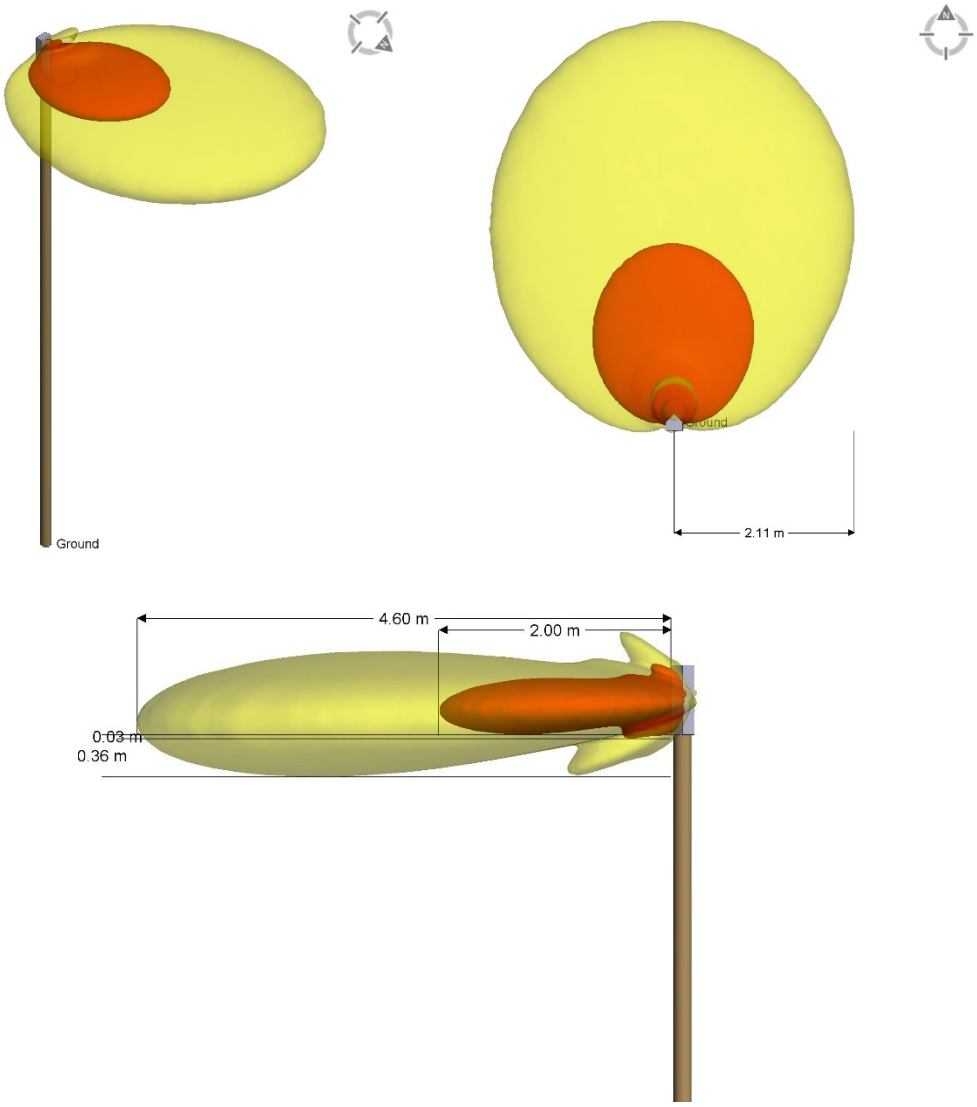


Figure 4 VVSSP-65S-R1B-4455 Compliance Boundary / Pattern Oblique, Overhead, & Side Views

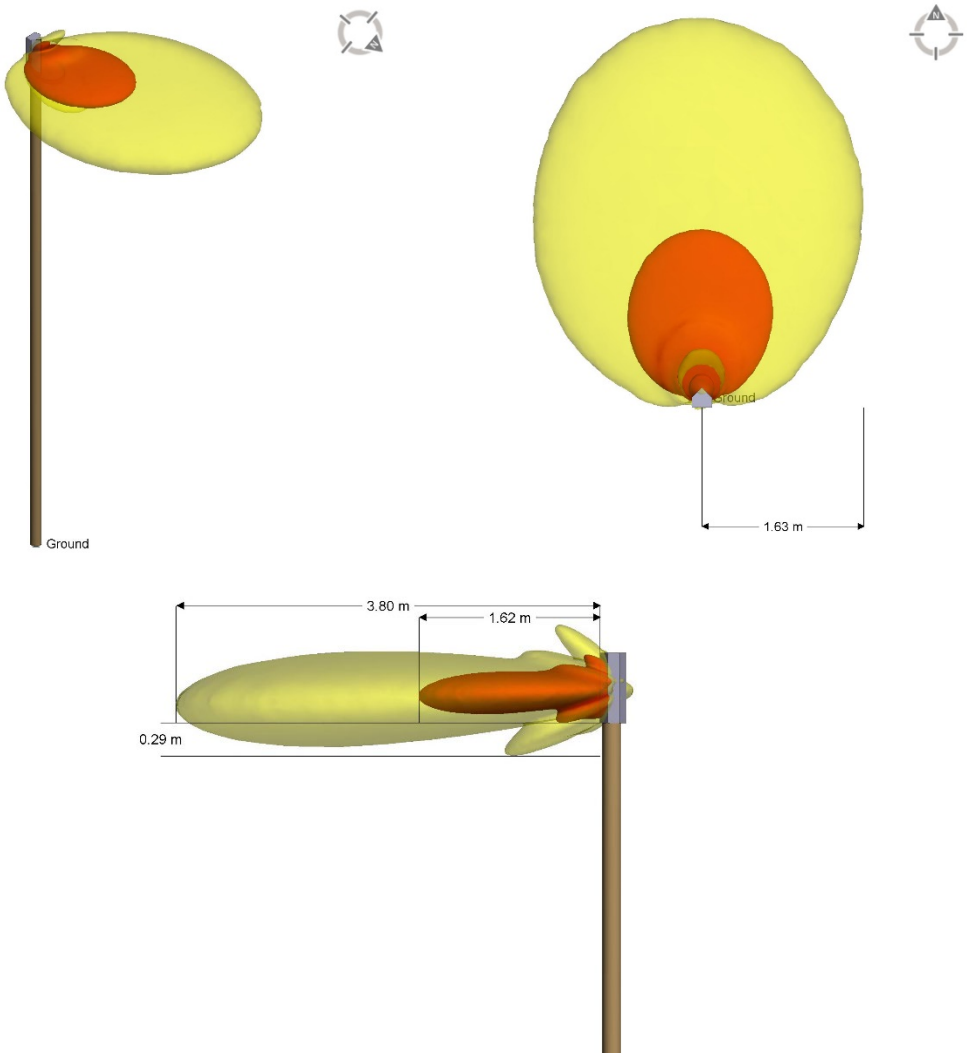


Figure 5 VVSSP-65S-R1B-4402 Compliance Boundary / Pattern Oblique, Overhead, & Side Views

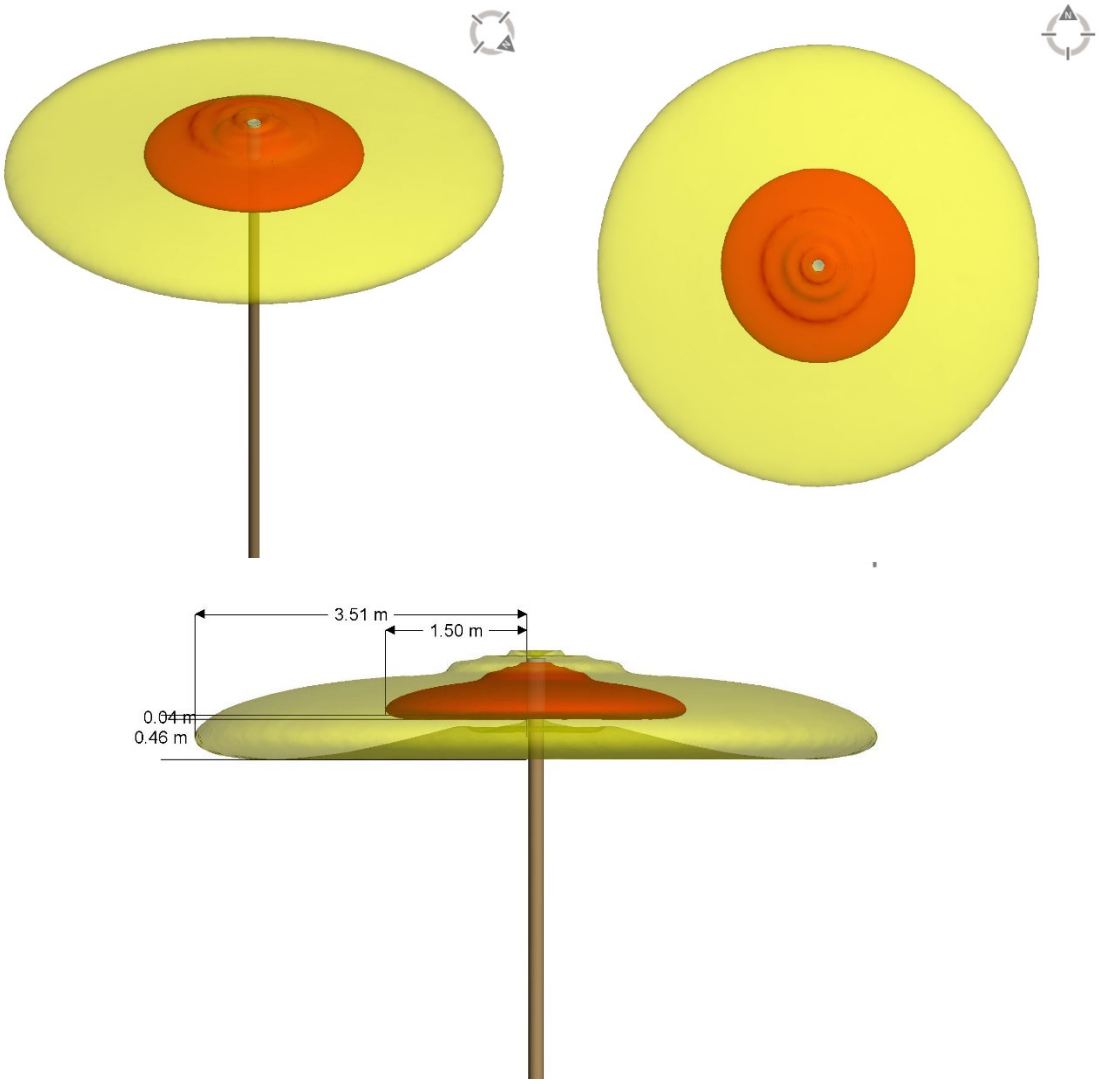


Figure 6 VVSSP-360S-F Compliance Boundary / Pattern Oblique, Overhead, & Side Views

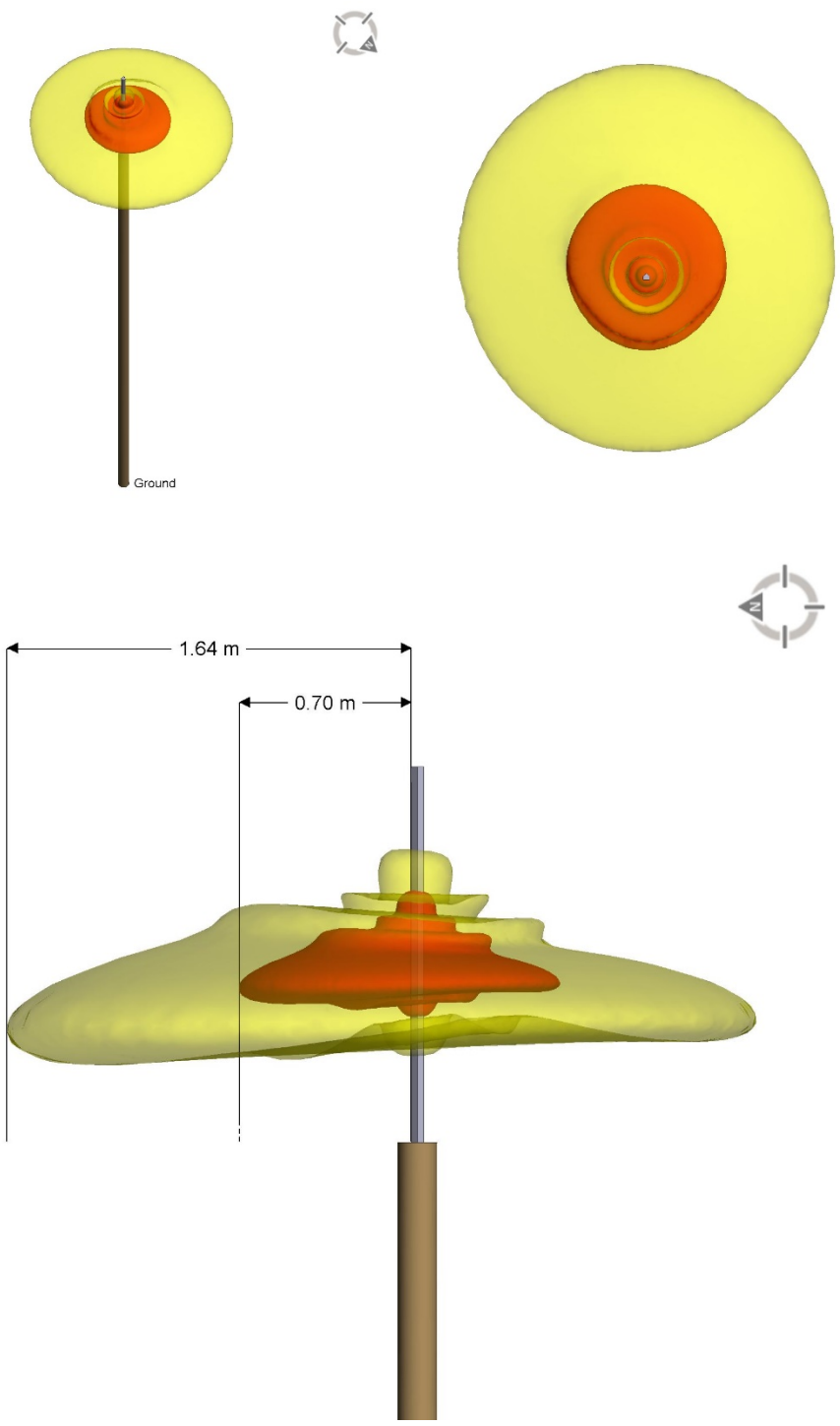


Figure 7 GO6010-07078 Compliance Boundary / Pattern Oblique, Overhead, & Side Views

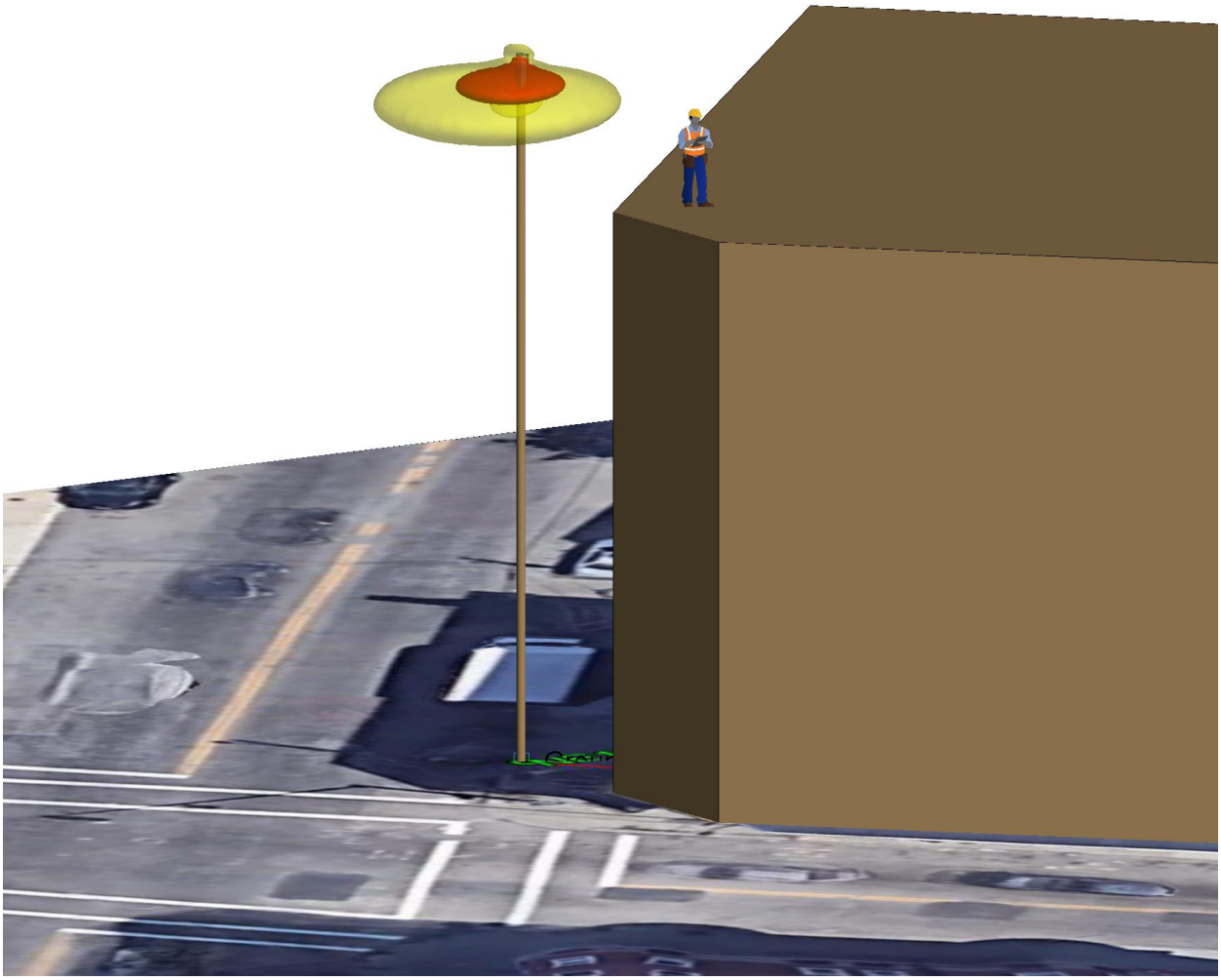


Figure 8 Site NE1217BA_11LAB with updated azimuth

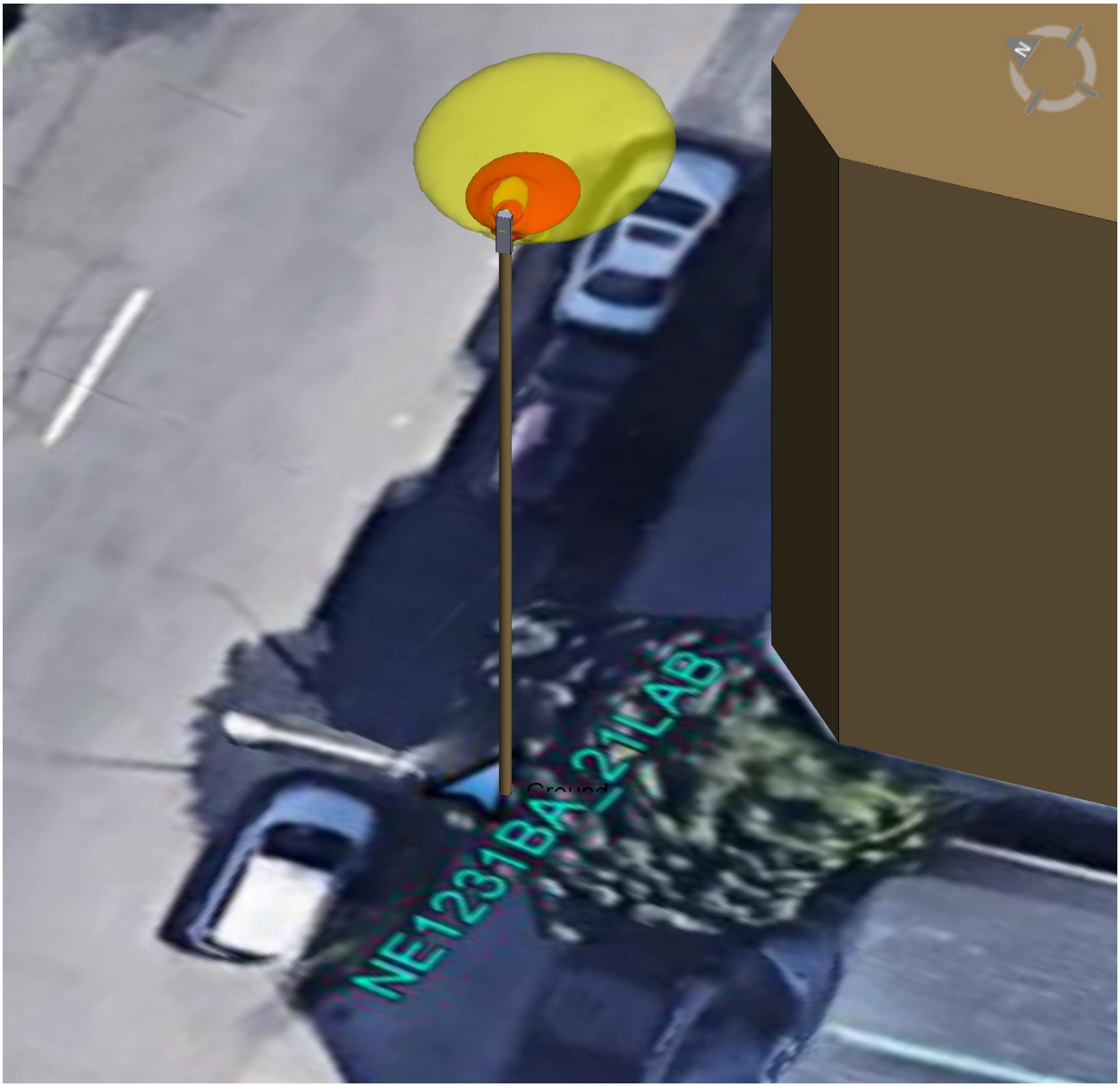


Figure 9 Site NE1230BA_21LAB with updated azimuth.

Malden+Revere+Lynn+Everett RF Exposure Assessment

The following table details each configuration and provides a compliance statement. Distances are converted to United States customary units.

Configuration	Carrier	Tech	Freq Band, MHz	Max Amplifier Power, dBm	System Loss, dB	Transmitter Count	Antenna	Antenna Max Gain, dBi	Max Transmit Power per Amp, EIRP	Antenna Horizontal Beamwidth, DEG	Antenna Vertical Beamwidth, DEG	Antenna Aperture, (ft)	General Public		Occupational	
													Worst-Case Horizontal Compliance Boundary, (ft)	Worst-Case Vertical Compliance Boundary, (ft)	Worst-Case Horizontal Compliance Boundary, (ft)	Worst-Case Vertical Compliance Boundary, (ft)
VVSSP-65S-R1B-4455	TMo	4G-LTE	1900	43.0	3.0	4	CommScope VVSSP-65S-R1B	12.3	52.3	74.0	19.7	2	15.1	1.2	6.6	0.1
	TMo	4G-LTE	2100	43.0	3.0	4		12.3	52.3	74.0	19.7					
	TMo	5G-LTE	2500	46.0	3.0	4		12.8	55.8	70.0	16.0					
VVSSP-65S-R1B-4402	TMo	4G-LTE	1900	37.0	3.0	4	CommScope VVSSP-65S-R1B	12.3	46.3	74.0	19.7	2	12.5	1.0	5.3	0.0
	TMo	4G-LTE	2100	37.0	3.0	4		12.3	46.3	74.0	19.7					
	TMo	5G-LTE	2500	46.0	3.0	4		12.8	55.8	70.0	16.0					
VVSSP-360S-F	TMo	4G-LTE	1900	43.0	3.0	4	CommScope VVSSP-360S-F	7.3	47.3	360.0	19.1	2	11.5	1.5	4.9	0.1
	TMo	4G-LTE	2100	43.0	3.0	4		7.3	47.3	360.0	19.1					
	TMo	5G-LTE	2500	46.0	3.0	4		8.2	51.2	360.0	15.6					
GO6006-06923	TMo	4G-LTE	1900	37.0	3.0	4	Galtronics GO6006-06923	6.8	40.8	150.0	45.3	?	5.4	0.0	2.3	0.0
	TMo	4G-LTE	2100	37.0	3.0	4		7.6	41.6	145.0	42.2					
	TMo	5G-LTE	2500	46.0	3.0	4		7.2	50.2	360.0	18.7					

The individual site evaluations are detailed here. The compliance distances have all been reviewed and there are no accessible areas within the General Population (GP) compliance boundary at any of these sites.

ExteNet Node ID	TMo Node ID	Latitude	Longitude	City	Configuration	RAD Center (ft)	"0°Ref" Arrow Az (°)	GP (ft)	OCC (ft)	Notes (distance to closest structures)
NE-MA-BSTN2N01-02001	NE2003BA_11LAB	42.433404	-71.036719	Malden	VVSSP-65S-R1B-4455	36.33	170	15.1	6.6	22' from adjacent and well above.
NE-MA-BSTN2N01-02002	NE2002BA_11LAB	42.434086	-71.039171	Malden	VVSSP-65S-R1B-4455	36.33	20	15.1	6.6	Well above and away from adjacent.
NE-MA-BSTN2N01-02003	NE2002BA_21LAB	42.437241	-71.038691	Malden	VVSSP-65S-R1B-4455	36.25	200	15.1	6.6	15' from adjacent and parallel.
NE-MA-BSTN2N01-02004	NE2003BA_21LAB	42.431648	-71.037322	Malden	VVSSP-65S-R1B-4455	31.50	310	15.1	6.6	> 20' from adjacent and parallel.
NE-MA-BSTN2N01-02005	NE2002BA_31LAB	42.435697	-71.038127	Malden	VVSSP-65S-R1B-4455	36.25	340	15.1	6.6	>20' from adjacent and away.
NE-MA-BSTN2N01-02006	NE2003BA_31LAB	42.432130	-71.035756	Malden	VVSSP-65S-R1B-4455	36.33	30	15.1	6.6	23' from adjacent and away.
NE-MA-BSTN2N01-02007	NE2004BA_11LAB	42.433448	-71.032245	Malden	VVSSP-65S-R1B-4455	36.33	170	15.1	6.6	>20' from adjacent and parallel.
NE-MA-BSTN2N01-02008	NE2004BA_21LAB	42.431990	-71.032008	Malden	VVSSP-65S-R1B-4455	36.33	240	15.1	6.6	>20' from adjacent and parallel.
NE-MA-BSTN2N01-02010	NE2005BA_11LAB	42.433798	-71.029079	Malden	VVSSP-65S-R1B-4455	36.33	20	15.1	6.6	23' from adjacent, toward, and above, OK.

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ExteNet Node ID	TMo Node ID	Latitude	Longitude	City	Configuration	RAD Center (ft)	"0°Ref" Arrow Az (°)	GP (ft)	OCC (ft)	Notes (distance to closest structures)
NE-MA-BSTN2N01-02011	NE2005BA_21LAB	42.432736	-71.026619	Malden	VVSSP-65S-R1B-4455	31.58	70	15.1	6.6	20' from adjacent, toward, and above, OK.
NE-MA-BSTN2N01-02012	NE2005BA_31LAB	42.434404	-71.025925	Malden	VVSSP-65S-R1B-4455	37.83	0	15.1	6.6	16' from adjacent, toward, and well above.
NE-MA-BSTN2N01-02013	NE2006BA_11LAB	42.433390	-71.024473	Malden	VVSSP-65S-R1B-4455	31.08	120	15.1	6.6	>20' from adjacent and away.
NE-MA-BSTN2N01-02014	NE2006BA_21LAB	42.430664	-71.025612	Malden	VVSSP-65S-R1B-4455	36.33	330	15.1	6.6	19' from adjacent and away.
NE-MA-BSTN2N01-02015	NE2006BA_31LAB	42.434915	-71.022231	Malden	VVSSP-65S-R1B-4455	31.92	120	15.1	6.6	>20' from adjacent and away.
NE-MA-BSTN2N01-02016	NE2007BA_11LAB	42.427588	-71.008169	Revere	VVSSP-65S-R1B-4455	40.50	140	15.1	6.6	>20' from adjacent and away.
NE-MA-BSTN2N01-02017	NE2007BA_21LAB	42.424791	-71.010730	Revere	VVSSP-65S-R1B-4455	36.42	330	15.1	6.6	10' from adjacent, above and parallel.
NE-MA-BSTN2N01-02018	NE2007BA_31LAB	42.425832	-71.009006	Revere	VVSSP-65S-R1B-4455	35.42	60	15.1	6.6	12' from adjacent and parallel.
NE-MA-BSTN2N01-02020	NE2008BA_11LAB	42.424599	-71.009502	Revere	VVSSP-65S-R1B-4455	32.67	120	15.1	6.6	30' from adjacent, toward, and above.
NE-MA-BSTN2N01-02023	NE2008BA_21LAB	42.421139	-71.006159	Revere	VVSSP-65S-R1B-4455	27.00	20	15.1	6.6	19' from adjacent, toward, and OK.
NE-MA-BSTN2N01-02024	NE2010BA_11LAB	42.418648	-70.989593	Revere	VVSSP-65S-R1B-4455	33.58	310	15.1	6.6	>20' from adjacent and away.
NE-MA-BSTN2N01-02025	NE2010BA_21LAB	42.418327	-70.991249	Revere	VVSSP-65S-R1B-4455	30.08	330	15.1	6.6	11' from adjacent and away.
NE-MA-BSTN2N01-02026	NE2010BA_31LAB	42.417878	-70.993568	Revere	VVSSP-65S-R1B-4455	36.25	100	15.1	6.6	>20' from adjacent and away.
NE-MA-BSTN2N01-02027	NE2011BA_11LAB	42.415878	-70.993473	Revere	VVSSP-65S-R1B-4455	36.25	30	15.1	6.6	6' from adjacent but well above.
NE-MA-BSTN2N01-02028	NE2011BA_21LAB	42.415448	-70.992323	Revere	VVSSP-65S-R1B-4455	31.25	60	15.1	6.6	>20' from adjacent and away.
NE-MA-BSTN2N01-02029	NE2009BA_11LAB	42.417105	-70.997931	Revere	VVSSP-65S-R1B-4455	36.33	170	15.1	6.6	>20' from adjacent and away.
NE-MA-BSTN2N01-02030	NE2012BA_11LAB	42.418007	-71.002684	Revere	VVSSP-65S-R1B-4455	35.25	210	15.1	6.6	16' from adjacent, above, and parallel.
NE-MA-BSTN2N01-02031	NE2009BA_21LAB	42.416144	-71.000694	Revere	VVSSP-65S-R1B-4455	30.25	150	15.1	6.6	>20' from adjacent and away.
NE-MA-BSTN2N01-02032	NE2011BA_31LAB	42.413005	-70.991353	Revere	VVSSP-65S-R1B-4455	42.17	290	15.1	6.6	>20' from adjacent and away.
NE-MA-BSTN2N01-02034	NE2024BA_11LAB	42.408317	-70.991802	Revere	VVSSP-65S-R1B-4455	40.83	350	15.1	6.6	>20' from adjacent and away.
NE-MA-BSTN2N01-02035	NE2024BA_21LAB	42.409542	-70.995300	Revere	VVSSP-65S-R1B-4455	40.67	115	15.1	6.6	17' from adjacent and parallel.
NE-MA-BSTN2N01-02037	NE2024BA_31LAB	42.406800	-70.992520	Revere	VVSSP-360S-F	40.08	300	11.5	4.9	> 30' from adjacent.
NE-MA-BSTN2N01-02038	NE2025BA_11LAB	42.405877	-70.994117	Revere	VVSSP-65S-R1B-4455	40.67	70	15.1	6.6	16' from adjacent, toward, and well above.
NE-MA-BSTN2N01-02039	NE2025BA_21LAB	42.404141	-70.993948	Revere	VVSSP-65S-R1B-4455	36.33	230	15.1	6.6	17' from adjacent and parallel.
NE-MA-BSTN2N01-02040	NE2025BA_31LAB	42.404010	-70.996202	Revere	VVSSP-65S-R1B-4455	40.75	250	15.1	6.6	17' from adjacent and parallel.
NE-MA-BSTN2N01-02042	NE2023BA_11LAB	42.407898	-70.998718	Revere	VVSSP-65S-R1B-4455	45.25	240	15.1	6.6	17' from adjacent and away.

Malden+Revere+Lynn+Everett RF Exposure Assessment

ExteNet Node ID	TMo Node ID	Latitude	Longitude	City	Configuration	RAD Center (ft)	"0°Ref" Arrow Az (°)	GP (ft)	OCC (ft)	Notes (distance to closest structures)
NE-MA-BSTN2N01-02043	NE2022BA_11LAB	42.408118	-70.999757	Revere	VVSSP-65S-R1B-4455	40.67	30	15.1	6.6	20' from adjacent and away.
NE-MA-BSTN2N01-02044	NE2023BA_21LAB	42.409949	-70.998522	Revere	VVSSP-65S-R1B-4455	30.83	160	15.1	6.6	12' from adjacent and away.
NE-MA-BSTN2N01-02045	NE2023BA_31LAB	42.410260	-70.998950	Revere	VVSSP-65S-R1B-4455	36.33	180	15.1	6.6	29' from adjacent at antenna level.
NE-MA-BSTN2N01-02046	NE2022BA_21LAB	42.408699	-71.000376	Revere	VVSSP-65S-R1B-4455	36.25	320	15.1	6.6	20' from adjacent, toward, 2' above roof, OK
NE-MA-BSTN2N01-02047	NE2021BA_11LAB	42.406453	-71.002119	Revere	VVSSP-65S-R1B-4455	40.75	20	15.1	6.6	48' from adjacent and toward, OK.
NE-MA-BSTN2N01-02048	NE2022BA_31LAB	42.406779	-71.000772	Revere	VVSSP-65S-R1B-4455	36.92	30	15.1	6.6	48' from adjacent and toward, OK.
NE-MA-BSTN2N01-02049	NE2021BA_21LAB	42.403178	-71.002817	Revere	VVSSP-65S-R1B-4455	33.75	30	15.1	6.6	18' from adjacent and away.
NE-MA-BSTN2N01-02050	NE2021BA_31LAB	42.402532	-71.002784	Revere	VVSSP-65S-R1B-4455	29.83	160	15.1	6.6	9' from adjacent, well above and away.
NE-MA-BSTN2N01-02051	NE2020BA_11LAB	42.406129	-71.007533	Revere	VVSSP-65S-R1B-4455	32.58	330	15.1	6.6	>20' from adjacent and parallel.
NE-MA-BSTN2N01-02052	NE2020BA_21LAB	42.403545	-71.009529	Revere	VVSSP-65S-R1B-4455	36.25	220	15.1	6.6	47' from adjacent and above.
NE-MA-BSTN2N01-02053	NE2020BA_31LAB	42.403885	-71.009886	Revere	VVSSP-65S-R1B-4455	37.17	60	15.1	6.6	10' from adjacent and 10' above.
NE-MA-BSTN2N01-02054	NE2019BA_11LAB	42.404040	-71.012891	Revere	VVSSP-65S-R1B-4455	36.25	300	15.1	6.6	25' from adjacent and parallel.
NE-MA-BSTN2N01-02055	NE2019BA_21LAB	42.404668	-71.014773	Revere	VVSSP-65S-R1B-4455	35.92	250	15.1	6.6	>20' from adjacent and away.
NE-MA-BSTN2N01-02056	NE2018BA_11LAB	42.406796	-71.011340	Revere	VVSSP-65S-R1B-4455	40.83	300	15.1	6.6	12' from adjacent and parallel.
NE-MA-BSTN2N01-02057	NE2018BA_21LAB	42.408436	-71.015298	Revere	VVSSP-65S-R1B-4455	40.83	90	15.1	6.6	17' from adjacent and parallel.
NE-MA-BSTN2N01-02058	NE2019BA_31LAB	42.406245	-71.013887	Revere	VVSSP-65S-R1B-4455	36.25	290	15.1	6.6	25' from adjacent and parallel.
NE-MA-BSTN2N01-02060	NE2018BA_31LAB	42.408133	-71.010072	Revere	VVSSP-65S-R1B-4455	36.25	150	15.1	6.6	19' from adjacent and parallel.
NE-MA-BSTN2N01-02061	NE2017BA_11LAB	42.411377	-71.007687	Revere	VVSSP-65S-R1B-4455	40.83	140	15.1	6.6	>20' from adjacent and away.
NE-MA-BSTN2N01-02062	NE2017BA_21LAB	42.409345	-71.004699	Revere	VVSSP-65S-R1B-4455	36.25	130	15.1	6.6	21' away and above.
NE-MA-BSTN2N01-02063	NE2016BA_11LAB	42.411891	-71.011816	Revere	VVSSP-65S-R1B-4455	36.33	290	15.1	6.6	>20' from adjacent and away.
NE-MA-BSTN2N01-02064	NE2012BA_21LAB	42.414018	-71.010224	Revere	VVSSP-65S-R1B-4455	36.25	0	15.1	6.6	16' from adjacent and away.
NE-MA-BSTN2N01-02065	NE2017BA_31LAB	42.411350	-71.002215	Revere	VVSSP-65S-R1B-4455	36.25	90	15.1	6.6	>20' from adjacent and away.
NE-MA-BSTN2N01-02066	NE2008BA_31LAB	42.418233	-71.003832	Revere	VVSSP-65S-R1B-4455	40.83	230	15.1	6.6	27' from adjacent and above.
NE-MA-BSTN2N01-02067	NE2009BA_31LAB	42.420702	-70.997619	Revere	VVSSP-65S-R1B-4455	36.25	110	15.1	6.6	29' from adjacent and above.
NE-MA-BSTN2N01-02068	NE2016BA_21LAB	42.414597	-71.013212	Revere	VVSSP-65S-R1B-4455	31.33	290	15.1	6.6	26' from adjacent and parallel.
NE-MA-BSTN2N01-02069	NE2015BA_11LAB	42.413844	-71.015696	Revere	VVSSP-65S-R1B-4455	40.75	120	15.1	6.6	16' from adjacent and parallel.
NE-MA-BSTN2N01-02070	NE2015BA_21LAB	42.412910	-71.016945	Revere	VVSSP-65S-R1B-4455	36.33	190	15.1	6.6	16' from adjacent and parallel.

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ExteNet Node ID	TMo Node ID	Latitude	Longitude	City	Configuration	RAD Center (ft)	"0°Ref" Arrow Az (°)	GP (ft)	OCC (ft)	Notes (distance to closest structures)
NE-MA-BSTN2N01-02071	NE2016BA_31LAB	42.410196	-71.015977	Revere	VVSSP-65S-R1B-4455	40.75	190	15.1	6.6	18' from adjacent and well above.
NE-MA-BSTN2N01-02072	NE2015BA_31LAB	42.411975	-71.018366	Revere	VVSSP-65S-R1B-4455	40.75	330	15.1	6.6	16' from adjacent and away.
NE-MA-BSTN2N01-02073	NE2014BA_11LAB	42.412893	-71.021696	Revere	VVSSP-65S-R1B-4455	36.25	10	15.1	6.6	>20' from adjacent and parallel.
NE-MA-BSTN2N01-02074	NE2014BA_21LAB	42.413026	-71.018785	Revere	VVSSP-65S-R1B-4455	37.67	310	15.1	6.6	>20' from adjacent and away.
NE-MA-BSTN2N01-02075	NE2014BA_31LAB	42.413101	-71.022456	Revere	VVSSP-65S-R1B-4455	36.33	200	15.1	6.6	>20' from adjacent and parallel.
NE-MA-BSTN2N01-02076	NE2013BA_21LAB	42.415270	-71.020513	Revere	VVSSP-65S-R1B-4455	37.17	310	15.1	6.6	>20' from adjacent and parallel.
NE-MA-BSTN2N01-02077	NE2013BA_31LAB	42.414337	-71.021838	Revere	VVSSP-65S-R1B-4455	35.33	330	15.1	6.6	>20' from adjacent and away.
NE-MA-BSTN2N01-02078	NE2013BA_11LAB	42.414953	-71.024481	Revere	VVSSP-65S-R1B-4455	35.92	150	15.1	6.6	19' from adjacent and away.
NE-MA-BSTN2N01-02083	NE2041BA_11LAB	42.412082	-71.030678	Revere	VVSSP-65S-R1B-4455	36.00	180	15.1	6.6	9' from adjacent and above.
NE-MA-BSTN2N01-02085	NE2066BA_11LAB	42.407431	-71.024480	Revere	VVSSP-65S-R1B-4455	32.67	100	15.1	6.6	>20' from adjacent and away.
NE-MA-BSTN2N01-02104	NE2030BA_31LAB	42.412556	-71.039622	Everett	VVSSP-65S-R1B-4455	40.75	340	15.1	6.6	14' from adjacent and parallel.
NE-MA-BSTN2N01-02148	NE2001BA_11LAB	42.428843	-71.065792	Malden	VVSSP-65S-R1B-4455	38.25	180	15.1	6.6	>20' from adjacent and parallel.
NE-MA-BSTN2N01-02149	NE2001BA_21LAB	42.427044	-71.069557	Malden	GO6006-06923	21.33	350	5.4	2.3	>30' from adjacent.
NE-MA-BSTN2N01-02150	NE2001BA_31LAB	42.427723	-71.063839	Malden	VVSSP-65S-R1B-4455	36.17	180	15.1	6.6	17' from adjacent and parallel.
NE-MA-BSTN2N01-02403	NE2067BA_21LAB	42.419511	-71.078168	Malden	VVSSP-65S-R1B-4455	36.17	80	15.1	6.6	11' from adjacent and parallel.
NE-MA-BSTN2N01-02404	NE2067BA_11LAB	42.420197	-71.079787	Malden	VVSSP-65S-R1B-4455	36.25	180	15.1	6.6	10' from adjacent and parallel.
NE-MA-BSTN2N01-02405	NE2067BA_31LAB	42.417718	-71.077007	Malden	VVSSP-65S-R1B-4455	37.58	270	15.1	6.6	>20' from adjacent and parallel.
NE-MA-LYNN1N01-01001	NE1240BA_11LAB	42.461751	-70.945281	Lynn	VVSSP-65S-R1B-4402	31.15	120	12.5	5.3	19' from adjacent and away.
NE-MA-LYNN1N01-01002	NE1240BA_21LAB	42.462840	-70.944349	Lynn	GO6006-06923	20.23	355	5.4	2.3	>30' from adjacent.
NE-MA-LYNN1N01-01003	NE1240BA_31LAB	42.463628	-70.945867	Lynn	GO6006-06923	20.23	105	5.4	2.3	17' from adjacent and away.
NE-MA-LYNN1N01-01004	NE1245BA_11LAB	42.464562	-70.944700	Lynn	VVSSP-65S-R1B-4402	31.15	205	12.5	5.3	7' from adjacent and parallel, OK.
NE-MA-LYNN1N01-01005	NE1220BA_11LAB	42.463330	-70.949861	Lynn	GO6006-06923	20.23	70	5.4	2.3	>30' from adjacent.
NE-MA-LYNN1N01-01006	NE1246BA_11LAB	42.463705	-70.943076	Lynn	GO6006-06923	20.23	305	5.4	2.3	>30' from adjacent.
NE-MA-LYNN1N01-01011	NE1246BA_21LAB	42.463307	-70.940907	Lynn	VVSSP-65S-R1B-4402	31.15	100	12.5	5.3	9' from adjacent and parallel.
NE-MA-LYNN1N01-01016	NE1211BA_11LAB	42.466389	-70.927964	Lynn	VVSSP-65S-R1B-4402	31.15	65	12.5	5.3	13' from adjacent and away.
NE-MA-LYNN1N01-01036	NE1243BA_21LAB	42.466900	-70.941470	Lynn	VVSSP-65S-R1B-4402	31.15	45	12.5	5.3	9' from adjacent and away.
NE-MA-LYNN1N01-01047	NE1232BA_21LAB	42.466407	-70.949419	Lynn	VVSSP-65S-R1B-4402	31.15	300	12.5	5.3	>20' from adjacent and away.

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ExteNet Node ID	TMo Node ID	Latitude	Longitude	City	Configuration	RAD Center (ft)	"0°Ref" Arrow Az (°)	GP (ft)	OCC (ft)	Notes (distance to closest structures)
NE-MA-LYNN1N01-01048	NE1245BA_21LAB	42.465307	-70.947612	Lynn	VVSSP-65S-R1B-4402	31.15	210	12.5	5.3	>30' from adjacent.
NE-MA-LYNN1N01-01049	NE1220BA_21LAB	42.465711	-70.952063	Lynn	VVSSP-65S-R1B-4402	31.15	30	12.5	5.3	>30' from adjacent.
NE-MA-LYNN1N01-01050	NE1220BA_31LAB	42.464426	-70.951330	Lynn	GO6006-06923	20.23	180	5.4	2.3	>30' from adjacent.
NE-MA-LYNN1N01-01051	NE1237BA_11LAB	42.459930	-70.949646	Lynn	VVSSP-65S-R1B-4402	31.15	220	12.5	5.3	5' from adjacent, well above, and parallel.
NE-MA-LYNN1N01-01057	NE1228BA_11LAB	42.460980	-70.964165	Lynn	VVSSP-65S-R1B-4455	31.65	25	15.1	6.6	11' from adjacent and away.
NE-MA-LYNN1N01-01058	NE1236BA_11LAB	42.457402	-70.966475	Lynn	VVSSP-65S-R1B-4455	35.65	340	15.1	6.6	>20' from adjacent and parallel.
NE-MA-LYNN1N01-01061	NE1235BA_11LAB	42.454970	-70.974243	Lynn	VVSSP-65S-R1B-4455	32.15	230	15.1	6.6	>20' from adjacent and parallel.
NE-MA-LYNN1N01-01062	NE1235BA_21LAB	42.454795	-70.977358	Lynn	VVSSP-65S-R1B-4455	31.15	240	15.1	6.6	>20' from adjacent and parallel.
NE-MA-LYNN1N01-01063	NE1233BA_11LAB	42.458463	-70.970221	Lynn	VVSSP-65S-R1B-4402	31.15	40	12.5	5.3	8' from adjacent, at roof, and parallel, OK
NE-MA-LYNN1N01-01064	NE1233BA_21LAB	42.458747	-70.972025	Lynn	VVSSP-65S-R1B-4455	35.65	330	15.1	6.6	17' from adjacent and away.
NE-MA-LYNN1N01-01065	NE1233BA_31LAB	42.460425	-70.968281	Lynn	VVSSP-65S-R1B-4402	31.15	350	12.5	5.3	30' from nearest adjacent.
NE-MA-LYNN1N01-01067	NE1228BA_21LAB	42.463585	-70.962447	Lynn	VVSSP-65S-R1B-4455	35.65	340	15.1	6.6	>20' from adjacent and parallel.
NE-MA-LYNN1N01-01071	NE1231BA_21LAB	42.462821	-70.959338	Lynn	VVSSP-65S-R1B-4402	31.15	75	12.5	5.3	14' from adjacent but close. Change to 75 degrees from 90.
NE-MA-LYNN1N01-01074	NE1217BA_11LAB	42.468602	-70.958205	Lynn	VVSSP-65S-R1B-4455	40.15	225	15.1	6.6	10' from adjacent, 6 feet above. Change to 225 from 165.
NE-MA-LYNN1N01-01075	NE1217BA_21LAB	42.469945	-70.960201	Lynn	VVSSP-65S-R1B-4455	35.65	140	15.1	6.6	>20' from adjacent and away.
NE-MA-LYNN1N01-01076	NE1230BA_11LAB	42.468508	-70.953274	Lynn	VVSSP-65S-R1B-4455	31.32	200	15.1	6.6	17' from adjacent and parallel.
NE-MA-LYNN1N01-01077	NE1230BA_21LAB	42.467199	-70.952550	Lynn	VVSSP-65S-R1B-4402	31.15	50	12.5	5.3	>20' from adjacent and away.
NE-MA-LYNN1N01-01078	NE1232BA_31LAB	42.467963	-70.951381	Lynn	VVSSP-65S-R1B-4402	31.15	60	12.5	5.3	9' from adjacent and away.
NE-MA-LYNN1N01-01085	NE1219BA_11LAB	42.470717	-70.962991	Lynn	VVSSP-65S-R1B-4455	35.65	20	15.1	6.6	17' from adjacent and parallel.
NE-MA-LYNN1N01-01088	NE1219BA_31LAB	42.473798	-70.961975	Lynn	VVSSP-65S-R1B-4455	35.65	320	15.1	6.6	>20' from adjacent and away.
NE-MA-LYNN1N01-01090	NE1235BA_31LAB	42.458980	-70.977591	Lynn	VVSSP-65S-R1B-4455	35.65	260	15.1	6.6	>20' from adjacent and parallel.
NE-MA-LYNN1N01-01091	NE1234BA_21LAB	42.463764	-70.975192	Lynn	VVSSP-65S-R1B-4455	39.65	260	15.1	6.6	>20' from adjacent and away.
NE-MA-LYNN1N01-01092	NE1234BA_31LAB	42.461738	-70.977899	Lynn	VVSSP-65S-R1B-4455	35.65	70	15.1	6.6	>20' from adjacent and away.
NE-MA-LYNN1N01-01099	NE1212BA_11LAB	42.472448	-70.982344	Lynn	VVSSP-65S-R1B-4455	35.65	330	15.1	6.6	20' from adjacent and parallel.
NE-MA-LYNN1N01-01101	NE1212BA_21LAB	42.472021	-70.987058	Lynn	VVSSP-65S-R1B-4455	31.65	260	15.1	6.6	22' from adjacent and well above next.
NE-MA-LYNN1N01-01104	NE1214BA_11LAB	42.467563	-70.976427	Lynn	VVSSP-65S-R1B-4455	35.65	165	15.1	6.6	>20' from adjacent and away.

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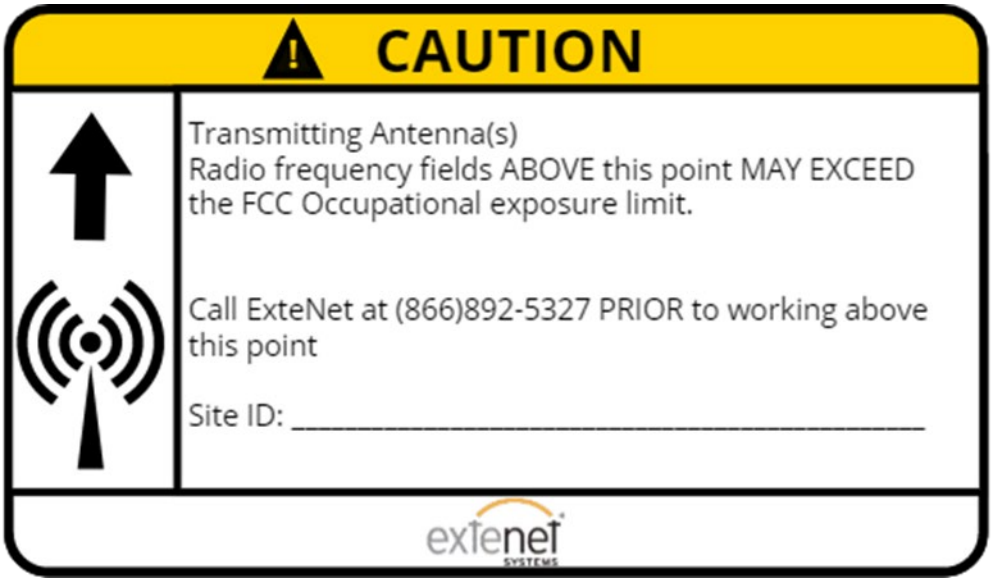
NE-MA-LYNN1N01-01110	NE1231BA_31LAB	42.461715	-70.958740	Lynn	VVSSP-65S-R1B-4455	35.65	75	15.1	6.6	>20' from adjacent and away.
NE-MA-LYNN1N01-01112	NE1216BA_31LAB	42.467102	-70.964923	Lynn	VVSSP-65S-R1B-4455	26.98	330	15.1	6.6	29' from adjacent, 24' from toward, roof same height, OK.
NE-MA-LYNN1N01-01113	NE1244BA_21LAB	42.465902	-70.970710	Lynn	VVSSP-65S-R1B-4455	35.65	350	15.1	6.6	>20' from adjacent and parallel.
NE-MA-LYNN1N01-01114	NE1244BA_31LAB	42.465988	-70.967692	Lynn	VVSSP-65S-R1B-4455	35.65	330	15.1	6.6	21' from adjacent and away.
NE-MA-LYNN1N01-01116	NE1215BA_21LAB	42.468964	-70.967598	Lynn	VVSSP-65S-R1B-4455	30.65	190	15.1	6.6	>20' from adjacent and away.
NE-MA-LYNN1N01-01119	NE1221BA_21LAB	42.464889	-70.970946	Lynn	VVSSP-65S-R1B-4455	35.65	290	15.1	6.6	4' from adjacent, away, and 15' above
NE-MA-LYNN1N01-01121	NE1215BA_31LAB	42.470009	-70.964615	Lynn	VVSSP-65S-R1B-4455	31.65	240	15.1	6.6	31' from adjacent and above.

RF Safety Program

ExteNet has an RF Exposure Safety Program for their transmitting sites. Part of this program requires the installation of signs near antennas where workers could access areas that exceed FCC RF exposure limits.

Based on this assessment, the following or similar signs should be installed on the pole approximately 3 feet below the antenna so they can be seen, read, and understood by a worker before they enter areas that may exceed exposure limits.



Regulatory Background

The federal government, through federal law and rules implemented by the Federal Communications Commission (FCC), has assumed authority over regulation of radiofrequency (RF) radiation exposure limits by wireless facilities. Under the United States Code, 47 USC § 332(c)(7)(B)(iv), no local government may regulate the placement, construction, or modification of wireless facilities on the basis of the environmental effects of RF emissions to the extent that such facilities comply with FCC regulations concerning such emissions. The FCC has adopted RF emission exposure standards published in the United States Code of Federal Regulations, 47 CFR § 1.1310, setting radiofrequency radiation exposure limits. The RF exposure limits are periodically reviewed by the FCC and updated, if needed. These regulations were most recently reviewed and updated in April 2020.

Conclusions

This assessment concludes that RF exposure in accessible areas near these installations will be below FCC limits for the General Public.

This engineer hereby certifies that these wireless facilities, operated by ExteNet Systems Inc., will comply with the RF exposure limits set forth by the FCC and as required by federal law.

If you have any questions on this assessment, please contact Sublight Engineering PLLC.

Engineering Statement

My professional engineer seal on this document certifies and affirms that:

I am registered as a Professional Engineer.

I am the principal of Sublight Engineering PLLC, in Arlington, Virginia.

I provide RF engineering services.

I am thoroughly familiar with the rules and regulations of the Federal Communications Commission (FCC) as well as the regulations of the Occupational Safety and Health Administration (OSHA), both in general and specifically as they apply to the FCC radiofrequency radiation exposure limits.

That I have prepared this RF Exposure Assessment and believe it to be true and accurate to the best of my knowledge.

October 22, 2020